Understanding Notification Stress of Smartphone Messenger App

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Abstract
Today, many smartphone users experience stress from receiving notifications all the time. In this work-in-progress paper, we explore the relationships between users' stress levels from receiving smartphone notifications and notification setting activeness from messenger app, and we also identify the implications to reduce stress. In order to understand the user, we selected the messenger application KakaoTalk, which is the most frequently used smartphone messenger application in Korea, and conducted an online survey of 95 smartphone user participants. We investigated how users actively set their smartphone notifications in their daily lives and how users become stressed from receiving these notifications. From this understanding, we propose design implications for notification interfaces in smartphones, in which the user can still be effectively aware of his or her notifications but can also reduce stress in his or her life.

Author Keywords
Notification; smartphone; stress; interruption; messenger app

ACM Classification Keywords
H.5.2. Information interfaces and presentation (e.g., HCI): User Interfaces

Figure 1. Smartphones offer various types of notifications.

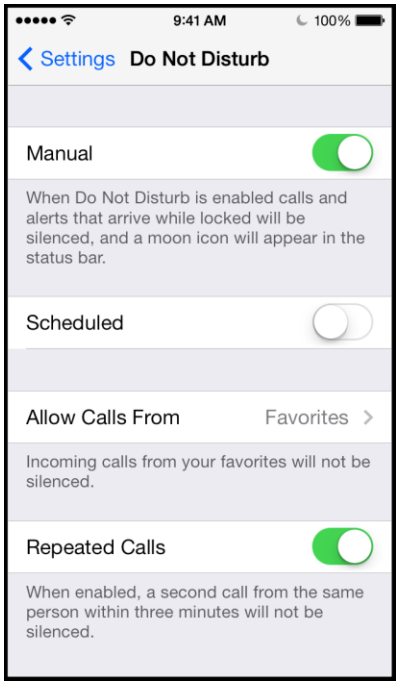

Figure 2. "Do not disturb" feature in iOS

Introduction

A smartphone notification is used in order to call a user's attention to updated information. The content types of using smartphone notifications include messenger messages, SMSs, phone calls, mail services, social network services, games, advertisements, system states, update alerts, etc. Smartphones offer various methods for receiving notifications, including a status bar, LED indicator, screen pop-up, vibration, sound, or a combination of these in order to let a user know that he or she has received a notification (Figure 1). Although OS systems or mobile applications provide notification settings in which users can select each option, these inordinate and various types of notifications from multiple purposes can irritate smartphone users. From this aspect, the use of smartphones can be the cause of user's stress [1].

Previous mobile notification studies focused on interruptions in mobile interaction [2,4], and the specific situation such as in a meeting [3]. However, there are not many studies for understanding on stress from notifications of user's own smartphone. Recently added functions, such as "Do not disturb" from iOS 6 (Figure 2) or "Blocking mode" or "Quiet time" from Samsung or LG Android smartphone (ver. Jelly Bean), demonstrates that notifications not only disturb others, but they also bother the users themselves.

In this work-in-progress paper, we try to investigate the factors of smartphone notifications to reduce stress before developing novel ways of notification based on messenger app. Social communication is one of the most frequent usage of smartphone activities. There are plenty of smartphone messengers supporting social communication, and the most popular ones are KakaoTalk, Line, What's App, and Facebook messengers. All of these offer similar functions and notification setting options. In Korea, 93% of smartphone users have installed KakaoTalk [5] and use it as a main application for social communication. Thus, we decided to focus on the KakaoTalk messenger notification and discovered how users actively set their smartphone notifications in their daily routines, as well as how users become stressed from their smartphone notifications.

Study Methods

A total of 95 smartphone users participated in this online survey. To plan the survey, a pilot interview was carried out for understanding the overall context of smartphone or KakaoTalk notifications and stress.

Pilot Interview

A pilot interview was conducted to look into the notification settings of smartphones and level of stress, as well as to find out other possible variables. We executed this study on a small number of KakaoTalk users in order to design the following user survey. Four participants, two males (23 and 25yrs), and two females (23 and 24yrs) have used their respective smartphones for at least three years. The finding from the interview was the main difference between the users: one type of user was one who was not aware of his or her ability to control the smartphone's notification settings and, therefore, became stressed; another actively customized his or her notification settings and did not get stressed. Considering this finding, we decided to explore whether user activeness on notification settings in KakaoTalk affects stress.

Question list of User Survey
Personal information
Smartphone type & OS version
I got {Psychological stress level (-3:never stressed ~ +3:highly stressed)} by the KakaoTalk notifications in daily life
I am {Activeness level (-3:very passive ~ +3:very active)} to set the KakaoTalk notifications
Usual state of notification settings in smartphone
Opinion on values of smartphone

Table 1. Question list of the user survey.

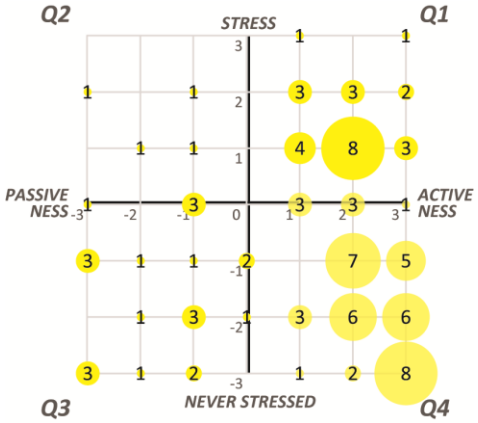

Figure 3. Survey results of stress level of notifications and activeness level of notification settings.

User Survey

We executed an online survey in order to understand that the activeness of the notification settings influenced the level of stress that the individual perceived. The online survey was made by Google Docs form and participants were recruited on Facebook voluntarily. The survey questions were composed of three main parts (Table 1). The first part focused on the activeness of the notifications setting and the stress level, which were determined on a scale of -3 (low) to +3 (high). The second focused on the current notification settings on the smartphone. Finally, in the third section, we asked open questions, such as those requesting the user's opinion on his or her smartphone. Among the 95 participants in the survey, 55 were male, and 40 were female. Sorting by smartphone OS, 67 were Android users, while 28 were iPhone users. More specifically, of the Android group, there were 41 males and 26 females. Of the iPhone group, 14 users were male, and another 14 users were female. The average age of participants was 25.08 (SD=3.92, range= 17–41yrs) and all Korean. The background of the participants varied from high school students, undergraduate students, graduate students, soldiers, company workers, designers, public officials, and researchers, which was deliberately established to understand the opinions and experiences of a wide range of smartphone users.

Survey Results

The results appeared to show that the stress level of notifications is evenly spread across the participants (M=-0.69, SD=1.73). The activeness level of notification settings is weighted towards high activeness (M=1.12, SD=1.91). If the two scales combine on a planar, we can see the graph as represented in Figure 3. The activeness level of notification settings corresponds to the X-axis, and the stress level of the notifications corresponds to the Y-axis. In this graph, we can see the four quadrants of smartphone messenger users.

Quadrants	Stress		Activeness		N
	M	SD	M	SD	
1	1.48	0.65	1.92	0.76	25
2	1.50	0.58	-1.75	0.96	4
3	-1.59	1.10	-1.64	1.09	22
4	-1.68	1.03	2.30	0.73	44
Total	-0.69	1.73	1.12	1.91	95

Table 2. The mean and standard deviation data of each quadrants of the user survey.

- Quadrant 1 (Q1): Sensitive Group (High Stress, High Activeness)

The first quadrant group consisted of users with high stress levels (score 1~3: a little stress to extreme stress) and high activeness levels (score 1~3: a little activeness to extreme activeness). Twenty-five participants answered that they became stressed from smartphone notifications and even actively set the notification themselves. It indicates that they are sensitive and wanted to control the notifications, but they were in difficult situations.

- Quadrant 2 (Q2): Disoriented Group (High Stress, Low Activeness)

The second quadrant group contained users with high stress levels (score 1~3: a little stress to extreme stress) and low activeness levels (score -3~0: extreme passiveness to normal). Only four participants were in this group, and they answered that they think that they

do not know what to do to set the notifications, and they did become stressed shiftlessly.

- Quadrant 3 (Q3): Indifference Group (Low Stress, Low Activeness)

The third quadrant group compromised users with low stress levels (score -3~0: never stressed to normal) and low activeness levels (score -3~0: extreme passiveness to normal). Twenty-two participants who felt bothered to set the notifications and received no stress from them were in this group. It stands for that they are indifferent people of smartphone.

- Quadrant 4 (Q4): Informed Group (Low Stress, High Activeness)

The fourth quadrant group consisted of users with low stress levels (score -3~0: never stressed to normal) and high activeness levels (score 1~3: a little activeness to extreme activeness). Forty-four participants belonged to this group, and they personally set the notifications and had light or no stress. It represents that they knew how to control the ways of smartphone properly what they want.

After dividing the four groups by their stress and activeness levels, we understood the characteristics of four quadrants. Q2 and Q3 (26 participants) who had weak motivation to set the notification can reduce the stress to induce setting the notification actively. Q4 (44 participants) were tried to set the notification actively for reducing stress themselves and they satisfied current systems. However, Q1 (25 participants) which is the most interesting group answered that they became stressed from notifications, even if they actively set them. We expected to find out the implications for notification design when we understand the situations and efforts of Q1 group. Therefore, we decided to focus a follow-up study of Q1 participants (in-depth interview) in this work-in-progress paper study.

In-depth Interview of Q1 participants

We carried out in-depth interviews for all 25 participants in Q1. We asked two questions ("What is the reason of your stress of the smartphone notification from KakaoTalk in daily routine?", "What was your effort to reduce the stress?"). Five reasons for user stress were identified as a result of the analysis of the in-depth interviews. The first one is a problem of group chat (R1: 12 participants). In this group chat room, multiple users send messages at the same time. A lot of messages are delivered to everyone in the chat room, and this notification storm causes stress to a user. In addition, it is important to mention that stress occurs when a user tries to find valuable information from a long chat history. The second problem comes from the user being afraid of missing important or emergency informations (R2: 5 participants). There were even some participants who would hear auditory hallucinations of notifications or feel phantom vibrations and become concerned about notification malfunctions. The third problem was the misunderstanding of expected mental models of smartphone messengers (R3: 3 participants). Some users thought that the smartphone messenger is like real-time chatting, but others thought that it is like a mailbox that stores the messages that users can read whenever they want. When these two groups chatted with each other, both became stressed when notifications were delivered at different expected times. Fourth, users were also receiving spam messages, such as service promotions or sale events (R4: 5 participants). Users had a strong

resistance of advertisements. Participants said that if spam messages repeated, then they would delete the messenger and re-install it. The fifth occurs in a situation in which the user cannot see the contents, or the user cannot control the smartphone (R5: 9 participants). This is stressful because it makes visual noise that the user wonders what the contents are but cannot see them.

Discussion and Design Implications from Q1

We analyzed the five reasons for stress in Q1, focusing on the messenger app and the situations. Each reason consisted of various context cues. We reorganized them into three factors from the perspective of notification interface design of smartphones.

Categorization by Contents

There should be notification options varied by contents. This is the most important factor of notifications regarding stress. One participant said, "I got stressed from spam messages like game invitations or company promotions" (R4). Another one said, "I am afraid of missing emergency messages" (R2). And, "After a huge chat in a group chat room, there is stress to check whether I have received important messages or just small talks" (R1). The notification interface should provide different options regarding the kind of information. We can manually select the on and off notifications for each chat room now, but it could automatically distribute by contents for notifications, for example in Google Gmail service which is distributing mails by primary, social, promotion tabs and filtering spam messages (Figure 4).

Figure 4. Gmail automatically distributes mails by contents.

Update Period

The user could set the notification update period from real-time to manual in the notification settings. For example, there should be options for real-time notifications, notifications updated every 30 minutes, or notifications updated when users manually turn the phone on. One said, "I have a lot of pressure when I chat with a person who thinks the messenger chat is real-time. Because I treat the smartphone messenger like a mailbox I can see when I want" (R3). Another participant said, "I got stressed when the notification was ringing just after the time I thought that the chat was over and turned off the screen" (R3). One answered, "I hate the continuous vibrations for notifications when members of the group chat room talked endlessly, so I have turned off the notification for the moment" (R1).

Method of Notification

The setting should have degrees of freedom from directly notifying to receiving no notice to being turned on/off fully and independently. People would use the vibration, sound, or LED status light properly, depending on their situation. One said, "When a group chat room is started, I turn the notification on or off related to the purpose of the room. And I frequently change to vibration notification mode and silent mode" (R1). But another said, "It is visually very annoying to see that mark for a new message in the status bar even if I turn off the notifications" (R4). One said, "I turn off all notifications when I have to concentrate on something" (R5). Another participant talked about the

inconvenient setting function, "In KakaoTalk, I can turn off the specific chat room even when I set it to get all notifications, but I can't turn on the specific one when I change my setting to not get all notifications."

Therefore, the messenger notification would control three factors: what kind of information the user receives, how long the update period is, and which method of notification can be used. It can help to reduce the stress of those who want to actively manage the notifications. But, these are preliminary at this step.

On the whole, participants connected the situation of the messenger itself with the stress of smartphone notifications together. For instance, the answer "It is very stressful to check the important messages in the group chat room history" is not from the stress of receiving notifications. The dissatisfaction with the messenger application may help answer the question regarding stress from receiving notifications as this may also prove that users have the same problems with both messenger and notifications.

Also, smartphone notifications are divided into two parts: the settings in the smartphone OS and the application. Even in the same application, settings can be different depending on the OS, for example Android and iOS. Users who use specific OS smartphones can become more stressed than others.

Future Works

In the future, we will conduct in-depth interviews of Q2, Q3, Q4, and analyze findings for design implications. Especially, we expect the deep understandings when we compare with Q1 and Q4 to find the differences of stress factors through focus group interview.

The current results indicate another needs for further studies into analyzing the accessibility of the notification setting interface. A second area would be the study of different mental models between smartphone messengers (real-time chat vs. mailbox functions). Third, we can expect a study on whether OS interfaces affect a user's stress or not. Lastly, the study can expand to explore the usage behaviors of smartphone not a specific app.

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